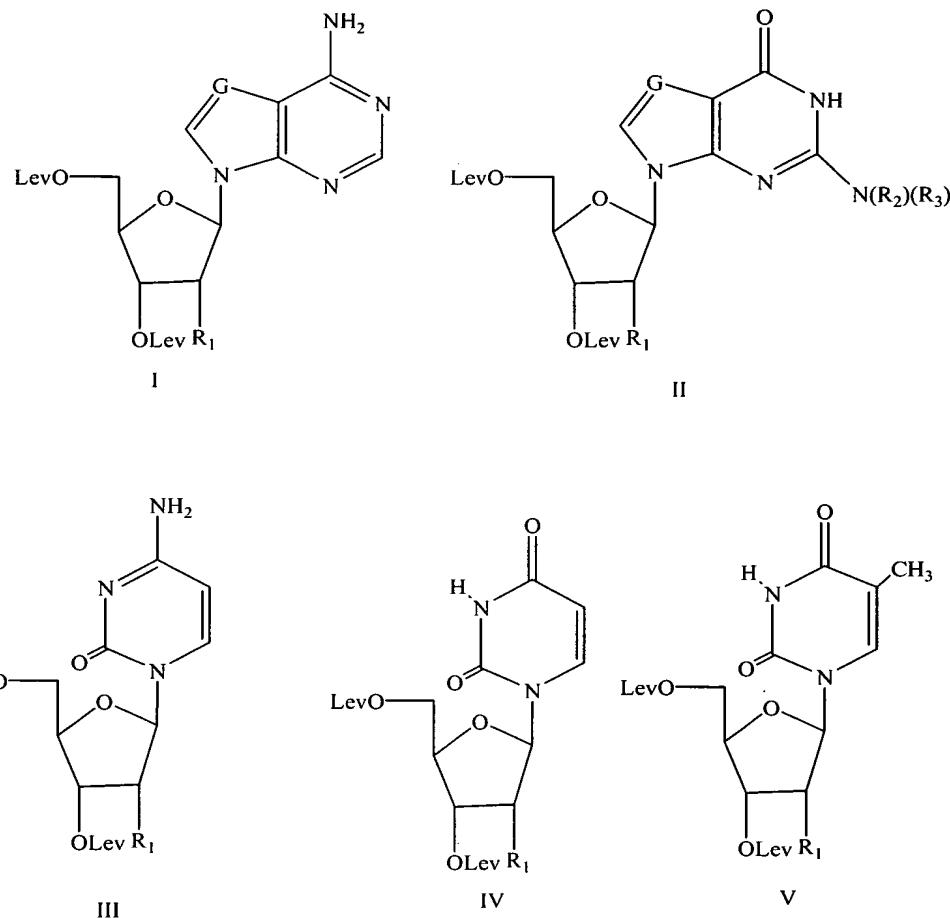


**What is Claimed:**

1. A method for the selective deprotection of a 3', 5'-di-*O*-levulinyl nucleoside comprising selecting a lipase effective to direct regioselective hydrolysis of one of said levulinyl positions of the nucleoside; and contacting the 3', 5'-di-*O*-levulinyl nucleoside with said lipase for a time and under conditions effective to yield the corresponding 3'-*O*-levulinyl and 5'-*O*-levulinyl nucleoside.
2. The method of claim 1 wherein said lipase is CAL-A, CAL-B, PSL-C, porcine pancreatic lipase, *Chromobacterium viscosum* lipase, *Mucor miehei* lipase, *Humicola lanuginosa* lipase, *Penicillium camemberti* lipase, or *Candida rugosa* lipase.
3. The method of claim 2 wherein said lipase is CAL-A.
4. The method of claim 2 wherein said lipase is CAL-B.
5. The method of claim 2 wherein said lipase is PSL-C.
6. A method for the selective deprotection of a 3', 5'-di-*O*-levulinyl nucleoside at the 5'-*O*-levulinyl position comprising selecting a lipase effective to direct regioselective hydrolysis of said 3', 5'-di-*O*-levulinyl nucleoside at the 5'-*O*-levulinyl position and contacting said 3', 5'-di-*O*-levulinyl nucleoside with said lipase for a time and under conditions effective to yield a 3'-*O*-levulinyl nucleoside.
7. The method of claim 6 wherein said lipase is CAL-B.
8. A method for the selective deprotection of a 3', 5'-di-*O*-levulinyl nucleoside at the 3'-*O*-levulinyl position comprising selecting a lipase effective to direct regioselective hydrolysis of said 3', 5'-di-*O*-levulinyl nucleoside at the 3'-*O*-levulinyl position and contacting said 3', 5'-di-*O*-levulinyl nucleoside with said lipase for a time and under conditions effective to yield a 5'-*O*-levulinyl nucleoside.
9. The method of claim 8 wherein said lipase is CAL-A.
10. The method of claim 8 wherein said lipase is PSL-C.
11. A method for the selective deprotection of a 3', 5'-di-*O*-levulinyl nucleoside at the 5'-*O*-levulinyl position comprising selecting a lipase effective to direct regioselective hydrolysis of said 3', 5'-di-*O*-levulinyl nucleoside at the 5'-*O*-levulinyl position and contacting said 3', 5'-di-*O*-levulinyl nucleoside with said lipase for a time and under conditions effective to yield a 3'-*O*-levulinyl nucleoside wherein said 3', 5'-di-*O*-levulinyl nucleoside has one of the following formulas:



wherein:

$R_1$  is -H, -hydroxyl, a protected hydroxyl, or a 2'-substituent; and

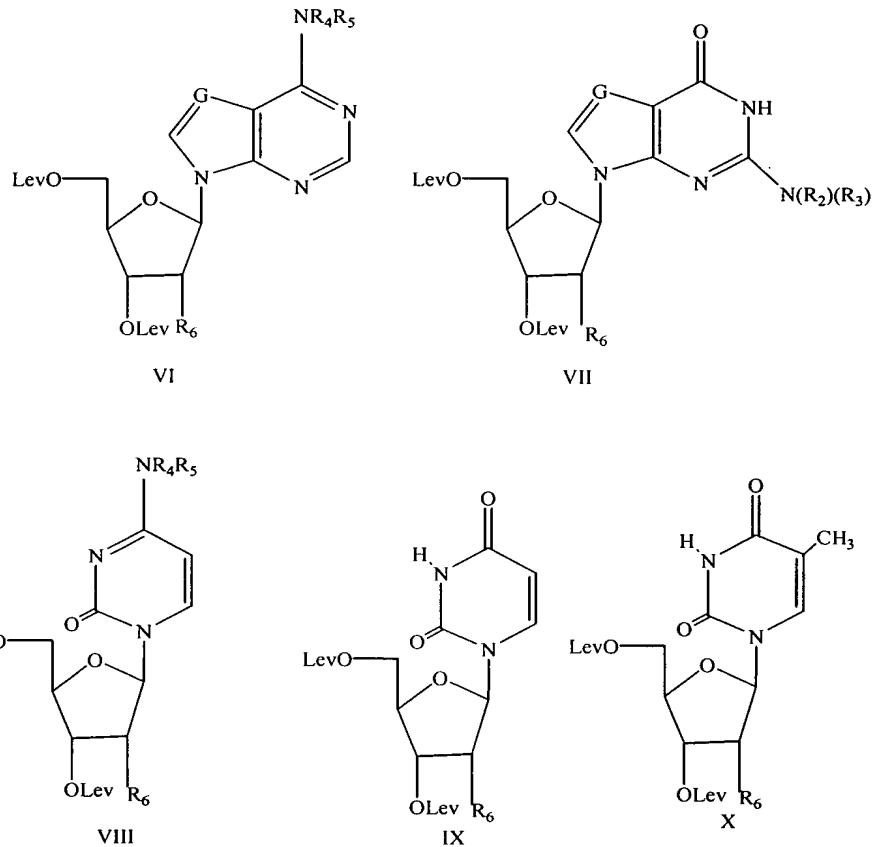
R<sub>2</sub> and R<sub>3</sub> are, independently, -H or an amino protecting group;

G is N or CH; and

Lev is  $-\text{C}(\text{O})-(\text{CH}_2)_2-\text{C}(\text{O})-\text{CH}_3$ .

12. The method of claim 11 wherein said lipase is CAL-B.
13. The method of claim 12 wherein said 3',5'-di-*O*-levulinyl nucleoside is an adenosine, cytosine, thymidine, or an *N*-isobutyl guanosine.
14. A method for the selective deprotection of a 3', 5'-di-*O*-levulinyl nucleoside at the 3'-*O*-levulinyl position comprising selecting a lipase effective to direct regioselective hydrolysis of said 3', 5'-di-*O*-levulinyl nucleoside at the 3'-*O*-levulinyl position and contacting said 3', 5'-di-*O*-levulinyl nucleoside with said lipase for a time and under conditions effective to yield a 5'-

*O*-levulinyl nucleoside wherein said 3', 5'-di-*O*-levulinyl nucleoside has one of the following formulas:



wherein:

$R_6$  is -H, or -OH;

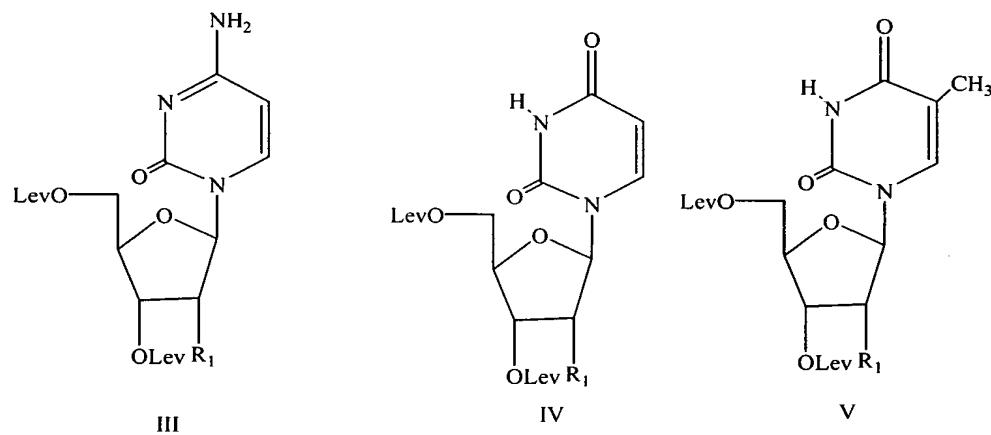
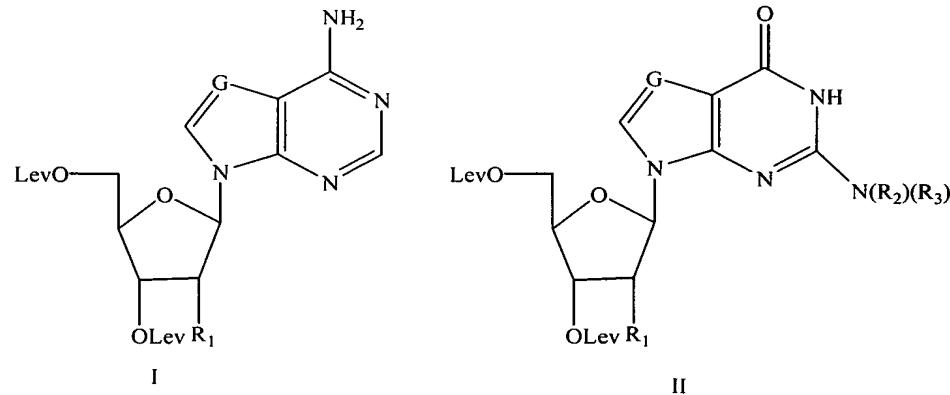
$R_2$ ,  $R_3$ ,  $R_4$ , and  $R_5$  are each, independently, -H or an amino protecting group;

G is N or CH; and

Lev is  $-\text{C}(\text{O})-(\text{CH}_2)_2-\text{C}(\text{O})-\text{CH}_3$ .

15. The method of claim 14 wherein said lipase is CAL-A.
16. The method of claim 14 wherein said lipase is PSL-C.
17. The method of claim 15 wherein said 3',5'-di-*O*-levulinyl nucleoside is 3',5'-di-*O*-levulinyl thymidine, 3',5'-di-*O*-levulinyl cytosine, or 3',5'-di-*O*-levulinyl *N*-benzoyl adenosine.
18. The method of claim 16 wherein said 3',5'-di-*O*-levulinyl nucleoside is *N*-isobutylguanosine.

19. A method for the selective deprotection of a 3', 5'-di-*O*-levulinyl nucleoside at the 5'-*O* levulinyl position wherein said 3', 5'-di-*O*-levulinyl nucleoside has one of the following formulas:



wherein:

R<sub>1</sub> is -H, -hydroxyl, a protected hydroxyl, or a 2'-substituent; and

R<sub>2</sub> and R<sub>3</sub> are, independently, -H or an amino protecting group;

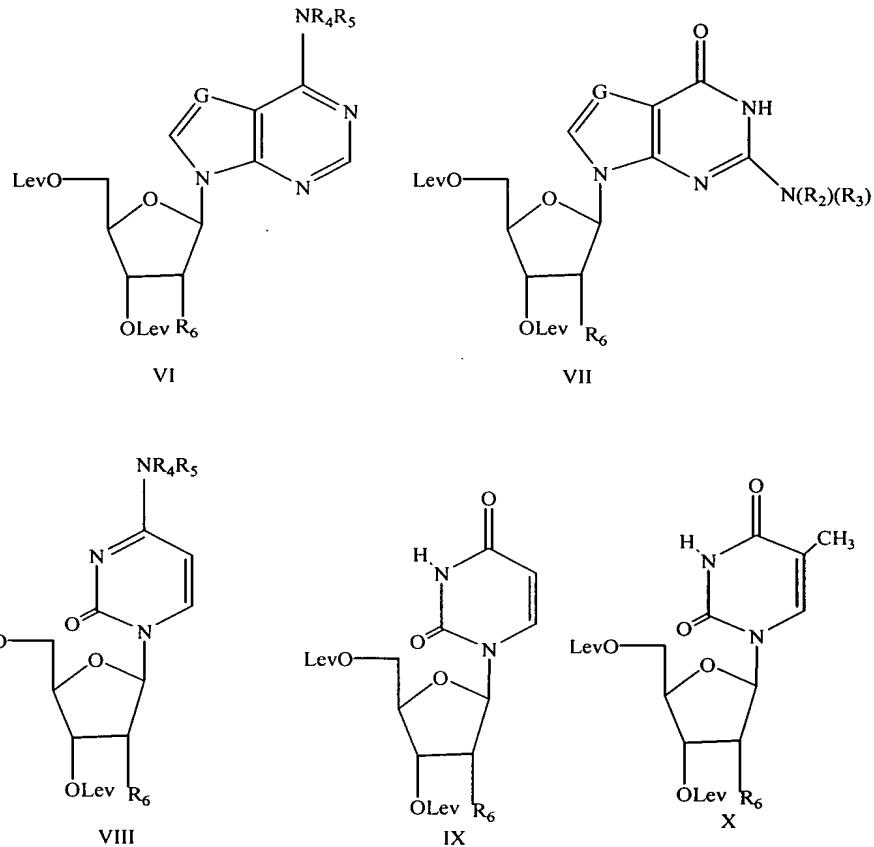
G is N or CH; and

Lev is -C(O)-(CH<sub>2</sub>)<sub>2</sub>-C(O)-CH<sub>3</sub>;

comprising contacting said 3', 5'-di-*O*-levulinyl nucleoside with CAL-B for a time and under conditions effective to hydrolyze said 3', 5'-di-*O*-levulinyl nucleoside at the 5'-*O*-levulinyl position.

20. The method of claim 20 wherein said 3'-,5'-di-*O*-levulinyl nucleoside comprises an adenosine, cytosine, thymidine, or an *N*-isobutyl guanosine moiety.

21. A method for the selective deprotection of a 3', 5'-di-*O*-levulinyl nucleoside at the 3'-*O*-levulinyl position wherein said 3', 5'-di-*O*-levulinyl nucleoside has one of the following formulas:



wherein:

$R_6$  is -H or -hydroxyl;

$R_2$ ,  $R_3$ ,  $R_4$ , and  $R_5$  are each, independently, -H or an amino protecting group;

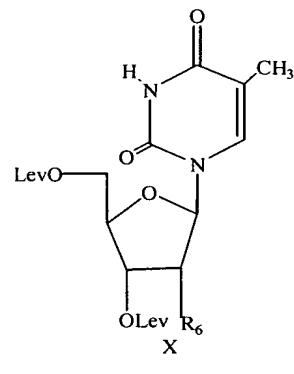
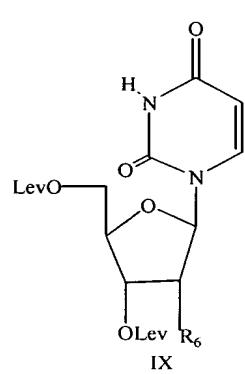
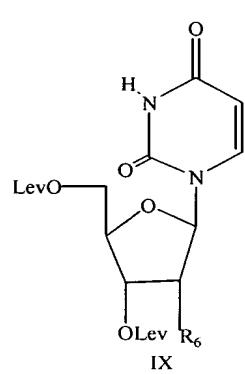
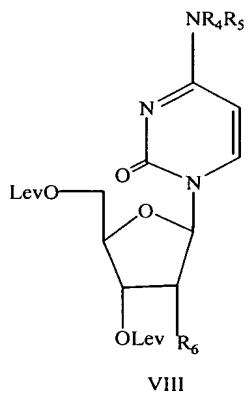
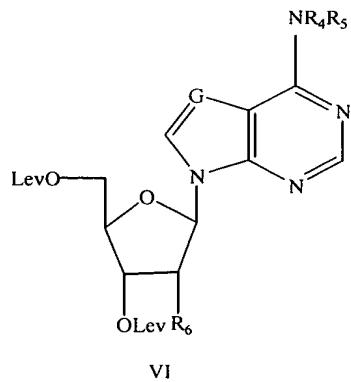
G is N or CH; and

Lev is  $-\text{C}(\text{O})-(\text{CH}_2)_2-\text{C}(\text{O})-\text{CH}_3$ ;

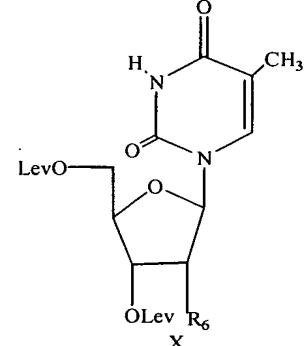
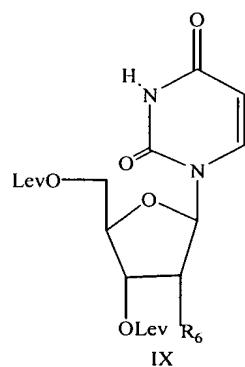
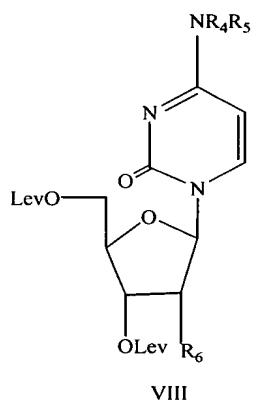
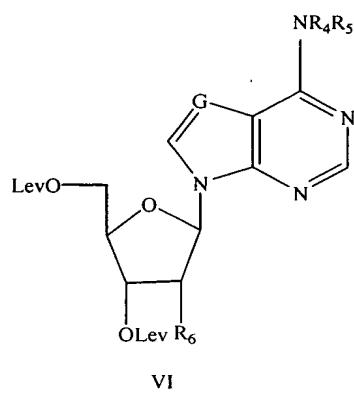
comprising contacting said 3', 5'-di-*O*-levulinyl nucleoside with PSL-C for a time and under conditions effective to hydrolyze said 3', 5'-di-*O*-levulinyl nucleoside at the 3'-*O*-levulinyl position.

22. The method of claim 20 wherein said 3'-,5'-di-*O*-levulinyl nucleoside comprises an *N*-isobutylguanosine moiety.

23. A method for the selective deprotection of a 3', 5'-di-*O*-levulinyl nucleoside at the 3'-*O*-levulinyl position wherein 3', 5'-di-*O*-levulinyl nucleoside has one of the following



formulas:



wherein:

$R_6$  is -H or -OH;

R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, and R<sub>5</sub> are each, independently, -H or an amino protecting group;

G is N or CH; and

Lev is  $-\text{C}(\text{O})-(\text{CH}_2)_2-\text{C}(\text{O})-\text{CH}_3$ ;

comprising contacting said 3', 5'-di-*O*-levulinyl nucleoside with CAL-A for a time and under conditions effective to hydrolyze said 3', 5'-di-*O*-levulinyl nucleoside at the 3'-*O*-levulinyl position.

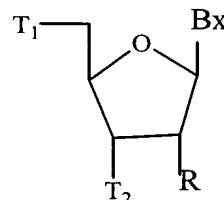
24. The method of claim 23 wherein said 3',5'-di-*O*-levulinyl nucleoside comprises a thymidine, cytosine, or *N*-benzoyl adenosine moiety.

25. A method for protecting a hydroxyl moiety of a nucleic acid having at least one of a 2'-O, 3'-O, or 5'-O position comprising reacting said nucleic acid with levulinic acid in the presence of a coupling agent that is attached to a polymeric support for a time and under conditions effective to form an ester at said 2'-O, 3'-O or 5'-O position.

26. The method of claim 25 wherein said nucleic acid is a nucleoside.

27. The method of claim 25 wherein said coupling agent is a carbodiimide.

28. The method of claim 25 wherein said carbodiimide is cyclohexylcarbodiimide.
29. The method of claim 25 wherein said polymeric support is a polystyrene.
30. The method of claim 25 wherein said polymeric support is a polyethylene glycol.
31. A method for acylating at least one hydroxyl moiety of a carbohydrate comprising reacting said carbohydrate with levulinic acid in the presence of a coupling agent that is attached to a polymeric support for a time and under conditions effective to form an ester.
32. The method of claim 31 wherein said coupling agent is a carbodiimide.
33. The method of claim 32 wherein said carbodiimide is cyclohexylcarbodiimide.
34. The method of claim 31 wherein said polymeric support is a polystyrene support.
35. The method of claim 31 wherein said polymeric support is a polyethylene glycol support.
36. A method for acylating at least one hydroxyl moiety of a steroid molecule comprising reacting said steroid molecule with levulinic acid in the presence of a coupling agent that is attached to a polymeric support for a time and under conditions effective to form an ester.
37. The method of claim 36 wherein said coupling agent is a carbodiimide.
38. The method of claim 37 wherein said carbodiimide is cyclohexylcarbodiimide.
39. The method of claim 36 wherein said polymeric support is a polystyrene support.
40. The method of claim 36 wherein said polymeric support is a polyethylene glycol support.
41. A method for protecting a hydroxyl moiety on a compound having the following formula:



wherein:

Bx is a nucleobase;

T<sub>1</sub> and T<sub>2</sub>, independently, are OH, a hydroxyl protecting group, an activated phosphate group, a nucleotide, a nucleoside, or an oligonucleotide;

R is -H, -hydroxyl, a protected hydroxyl or a 2' substituent group;

provided that at least one of T<sub>1</sub>, T<sub>2</sub> or R is -OH;

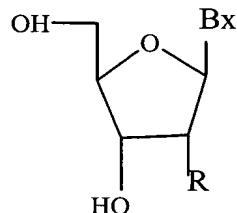
comprising reacting said compound with levulinic acid in the presence of a coupling agent that is attached to a solid support for a time and under conditions effective to form an ester between said hydroxyl moiety and the levulinyl group.

42. The method of claim 41 wherein said coupling agent is a carbodiimide.
43. The method of claim 42 wherein said carbodiimide is a cyclohexylcarbodiimide.

44. The method of claim 41 wherein said polymeric support is a polystyrene support.

45. The method of claim 41 wherein said polymeric support is a polyethyleneglycol support.

46. A method for protecting the 3'-O and 5'-O positions of a compound having the following formula:

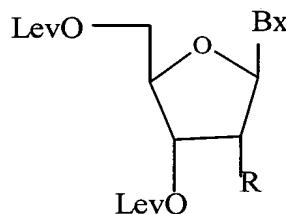


wherein:

$B_x$  is a nucleobase; and

$R$  is  $-H$ , or a 2' - substituent;

comprising reacting said compound with levulinic acid in the presence of a coupling agent that is attached to a solid support for a time and under conditions effective to form a compound having formula:

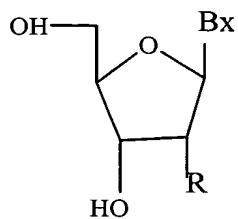


wherein Lev is a -levulinyl.

47. The method of claim 46 wherein said coupling agent attached to a polymeric support is cyclohexylcarbodiimide attached to a polymeric support.

48. The method of claim 47 wherein said polymeric support is a polystyrene polymeric support.

49. A method for protecting the 3'-O and 5'-O positions of a compound having the following formula:

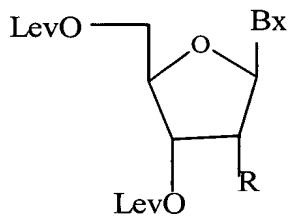


wherein:

$B_x$  is a nucleobase; and

$R$  is  $-H$ , or a  $2'$ - substituent;

comprising reacting said compound with levulinic acid in the presence of cyclohexylcarbodiimide that is attached to a polystyrene polymeric support for a time and under conditions effective to form a compound having the following formula:



wherein Lev is -levulinyl.

50. A method for acylating a hydroxyl moiety comprising reacting said hydroxyl moiety with levulinic acid in the presence of a coupling agent that is attached to a polymeric support for a time and under conditions effective to yield an ester.

51. The method of claim 50 wherein said coupling agent is a carbodiimide

52. The method of claim 51 wherein said carbodiimide is cyclohexylcarbodiimide.

53. The method of claim 50 wherein said polymeric support is a polystyrene.

54. The method of claim 50 wherein said polymeric support is polyethylene glycol.

55. A method for generating a cyclohexylcarbodiimide derivatized polymeric support from a cyclohexylurea derivatized polymeric support comprising reacting said cyclohexylurea derivatized polymeric support with a dehydrating agent in an organic solvent for a time and under conditions effective to yield said cyclohexylcarbodiimide derivatized polymeric support.

56. The method of claim 55 wherein said dehydrating agent is  $POCl_3$ .

57. The method of claim 55 wherein said dehydrating agent is tosylchloride.

58. The method of claim 55 wherein said organic solvent is  $CH_2Cl_2$ ,  $CHCl_3$ , hexane, or pyridine.

59. The method of claim 55 wherein said polymeric support is a polystyrene polymeric support.

60. A method for generating a cyclohexylcarbodiimide derivatized polymeric support from a cyclohexylurea derivatized polymeric support comprising the steps of:

reacting said cyclohexylurea derivatized polymer support with a dehydrating agent in an organic solvent for a time and under conditions effective to form a salt;

contacting said salt with an aqueous solution to form said cyclohexylcarbodiimide derivatized polymeric support.

61. The method of claim 60 wherein said dehydrating agent is  $\text{POCl}_3$ .

62. The method of claim 60 wherein said dehydrating agent is tosylchloride.

63. The method of claim 60 wherein said organic solvent is  $\text{CH}_2\text{Cl}_2$ ,  $\text{CHCl}_3$ , hexane, or pyridine.

64. The method of claim 60 wherein said polymeric support is a polystyrene polymeric support.